DRAFT

Section 6

Groundwater Monitoring

Contents

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Groundwater Monitoring

Introduction

Groundwater monitoring is intended to collect information concerning groundwater chemical and physical properties to determine the extent and magnitude of impacts from releases. Owners and operators (herein "O/O") typically conduct groundwater monitoring throughout the investigation and cleanup of a petroleum release, as well as afterward to verify cleanup was achieved. Groundwater contamination is the primary factor that impacts cleanup strategy and regulatory requirements for releases where groundwater is impacted. Adequate quantity and quality of groundwater monitoring data are necessary to support regulatory decisions concerning cleanup and mitigation of risks to human health and the environment. Administrative Rules of Montana 17.56.605(6) (ARMs) state:

> The cleanup plan must contain a plan and schedule for compliance monitoring to evaluate the effectiveness of cleanup activities. Compliance monitoring must continue for a period of at least 2 years after completion of cleanup activities specified in the cleanup plan, or another reasonable time period approved by the department. Results of compliance monitoring will be evaluated by the department on a site-specific basis and compared to cleanup goals that should be outlined in the cleanup plan. Final completion of cleanup activities and compliance monitoring must be approved by the department.

Because many factors affect groundwater contaminant plumes that change through time, recurrent monitoring is critical in understanding risks posed by the contaminant plume. Therefore it is important to collect more frequent samples during investigation and cleanup activities before the plume's steady state conditions are adequately documented. Technical Guidance Document # 12 Groundwater Monitoring discusses frequency of monitoring required under long-term conditions. Quarterly groundwater monitoring is typically required for a period of one year or until site conditions have been fully defined. Other monitoring schedules may include semiannual, annual or biannual. Monitoring and reporting schedules may differ on some sites. For instance, O/O may conduct quarterly or semiannual monitoring at some sites, but only prepare one report each year that includes all sampling events. The Department of Environmental Quality project managers (herein "PM") will clearly identify what report frequency is required when requesting the O/O to complete groundwater monitoring.

The groundwater CAPs and reports discussed herein, are intended for stand-alone work efforts. When groundwater monitoring is part of a remedial investigation (herein "RI") or cleanup CAP, a stand-alone groundwater monitoring CAP is typically not necessary. When O/Os conduct groundwater monitoring as part of an RI or cleanup CAP, the reporting format should comply as close as possible to the Groundwater Monitoring Report (MR-01) format. The Department may also require the use of an abbreviated CAP (AC-01) and report (AR-01), or a site-specific CAP for groundwater monitoring at some sites. [Section 7 of this guidance discusses Abbreviated CAPs and Reports.] Abbreviated CAPs and reports are typically utilized when release sites are undergoing long-term monitoring of potentially stable or shrinking contamination plumes, or when limited data is needed to fill a data gap. The PM will clearly identify what CAP report formats are required when requesting the O/O to complete groundwater monitoring.

Standardized CAP and Report formats are Applicable to Most Release Investigations

Standardized CAP and report formats discussed in this guidance should address the majority of release sites. However, DEQ understands that they may not address the needs of every release. The O/Os should conform to standardized formats in this guidance whenever possible to facilitate review of documents and to ensure adequate information is collected to make proper decisions to safeguard human health and the environment. When PMs determines non-standard site-specific CAPs and/or reports are necessary, they will clearly outline precisely what will be required and use as much of the standardized CAP and Report formats as possible. Only the DEQ PM can approve modification to the CAP and report formats in this guidance, or the use of site-specific CAPs and reports. Approval to use CAP and report formats must be granted by DEQ before the work is completed, and not after the fact. Owners and operators are encouraged to contact the PM to clarify any portion of a work request they do not fully understand, or to confer on draft work products as they are being prepared.

CAP_MR-01
Standardized Corrective Action Plan for Groundwater Monitoring

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY PETROLEUM RELEASE SECTION (PRS)
(Revised April 6, 2004)

The following lists minimal requirements for a Groundwater Monitoring Corrective Action Plan (CAP). Please omit any section describing tasks that were not requested by the department and note the omission in the Groundwater Monitoring report.

1. COVER LETTER **(This letter should be no longer than one page)**
   - 1.1 Date
   - 1.2 Responsible Party's Name and Mailing Address
   - 1.3 Contact Person's Name and Mailing Address (if different from above).
   - 1.4 Subject Line with the following information:
     Title [Corrective Action Plan and Budget for (Frequency) Groundwater Monitoring from (start date) to [completion date] for the Petroleum Release at (Facility Name, Street Address, Town), MT (Zip Code); DEQ Facility ID (Number) and Release (Number)].
   - 1.5 Introductory paragraph containing reference to DEQ's request for corrective action plan, and number and frequency of monitoring events to be conducted.
   - 1.6 Consultant's Name, Address and Phone Number (if not on letterhead).
   - 1.7 Name of person who prepared the workplan.

2. SUMMARY OF SITE CONDITIONS AND BACKGROUND

- 2.1 Type of contamination identified at site.
- 2.2 Summary of regulatory history and current site status. What work has already been done and what do we already know about the release and its potential threats to human health and the environment?
- 2.3 What is the depth to first groundwater?
- 2.4 What are the contaminants of concern and potential concern?

3. PURPOSE AND OBJECTIVES OF SAMPLING

- 3.1 (to confirm cleanup; monitor contaminant fate and transport; confirm monitored natural attenuation…etc.)

4. PROPOSED WORK

- 4.1 Number of sampling events included in this CAP.
- 4.2 Number of samples and parameters analyzed and frequency of sampling (may be depicted in tabular format)
- 4.3 Description of methodology (existing supply wells, monitoring wells, direct push…etc.)
- 4.4 Sampling methodology (collection, field screening, and analysis)
- 4.5 Proposed sample location map. (reproduced from RI report with all site information)
- 4.6 QA/QC plan (may be on-file with DEQ, or included in an appendix)
- 4.7 Data compilation and synthesis
- 4.8 Preparation of maps, cross-sections

4.9 Report preparation

5. SCHEDULE

Include times when phases of work will begin, when they will be completed, and when information and reports will be provided to DEQ. If specific dates cannot be determined until after the CAP is approved, then provide generic timeframes.

6. BUDGET

7. APPENDICES

7.1 Quality assurance/quality control (QA/QC) plan for all methods and sampling proposed (may be on file with DEQ)

7.2 Standard operating procedures (SOPs) for all methods and sampling proposed (may be on file with DEQ)

7.3 Disposal of investigation derived waste plan.

MR-01
Standardized Report Format for
Groundwater Monitoring at a Petroleum Release Site

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY PETROLEUM RELEASE SECTION (PRS)
(Revised April 9, 2004)

The DEQ requires a certain amount of detail in these reports. A large amount of this detail is duplicated from report to report. The facility location, geology, hydrogeology and sampling protocols should not change significantly. Certain sections of some reports may be excerpted from other reports with little or no modification (e.g., sampling protocol followed for drilling or groundwater sampling, QA/QC procedures, etc.). The tables and maps need to be updated if they include new data, but no major changes are normally needed. The appendices of the document may be from other sources (e.g., sample results from the laboratory) or duplicates (e.g., standard sampling protocol followed. Once a Groundwater Monitoring Report is prepared for a site, subsequent reports should take less time, effort and cost to prepare.

The following lists minimal requirements for a Groundwater Monitoring Report. Some of the listed sections may not apply to the scope of work conducted under the approved Groundwater Monitoring CAP for the release. Omit any section in the Standardized Report which does not apply to the scope of work conducted under the Groundwater monitoring CAP, and provide an explanation for the omission in the Groundwater Monitoring Report.

1. Title Page
- 1.1 Title of Report (e.g., quarterly/semiannual/annual/biannual groundwater monitoring report)
- 1.2 Facility Name
- 1.3 Facility Address
- 1.4 DEQ Facility ID Number and Release Number
- 1.5 Responsible Parties Name, Mailing Address and Phone Number
- 1.6 Consultant's Name, Address and Phone Number
- 1.7 Contact Persons Name, Mailing Address and Phone Number (if different from above)
- 1.8 Date report Prepared
- 1.9 Title and date of approved Groundwater Monitoring CAP

2. Table of Contents
- 2.1 Includes titles of report sections and page numbers
- 2.2 List of tables and figures
- 2.3 List of appendices

3. Description of Sampling Event(s)

3.1 Describe all monitoring events that are being reported in this report for the first time to DEQ.

3.2 If new or replacement monitoring wells, piezometers, or other sampling points were constructed and not already reported to DEQ, include a description of those points and their construction event(s).

4. Graphic Presentation

4.1 Include site maps (plot plans) that are drawn to scale with a North arrow that remains consistent from one reporting period to the next.

4.2 Facility site map depicting locations of groundwater sampling points, former and existing USTs, utilities, piping, dispensers, underground utilities, hazardous material/waste storage areas, floor and storm drains (information may be shown on more than one map for clarity)

4.3 Groundwater potentiometric map with groundwater gradient indicated

4.4 Isoconcentration contour map or site drawing depicting groundwater contamination with concentration boxes for each sample location. This should include at least one mapped parameter for each fuel type of interest (i.e. benzene gasoline releases, TEH for diesel releases…etc.). The PRS project manager should be consulted on which parameters to plot.

5. Tabular Presentation

The following data shall be presented in table(s) to show a chronological history and allow quick and easy reference. Multiple tables should included, if it makes the data more understandable. The tables should include all monitoring wells that have ever existed at the site. Footnotes should explain wells that could not be sampled for any monitoring event, wells that no longer exist, and newer wells that are installed as replacements.

5.1 Well designations

5.2 Measurement/sampling dates

5.3 Groundwater elevation

5.4 Phase separated product elevation

5.5 Phase separated product thickness

5.6 Purge volumes

5.7 Analytical results with RBSL/WQB-7 exceedences highlighted

5.8 Well construction, including: well casing elevation, total casing and screen depth, and depth to top of screen (this is intended to easily identify monitoring events when the water table was above the well screen)

6. Graphs and Trends

Graphs showing water level measurements, free product, or contaminant concentrations in a graphical form to depict trends over time.

7. Discussion

7.1 Present a discussion of the field and laboratory results including:

7.2 State whether the groundwater plume is fully defined both on and off-site or areas where the plume is undefined

7.3 Data anomalies
7.4 Variations from protocol
7.5 Condition of wells including vaults and seals
7.6 Data interpretations
7.7 Conclusions and recommendations

8. Appendices

8.1 Complete laboratory analytical reports with chains of custody
8.2 Well purging and sampling documentation including: equipment used, date and time, and on-site water quality measurements
8.3 Decontamination procedures
8.4 Field QA/QC control methods
8.5 Sample preservation
8.6 Documentation of product volume recovered and disposal method
8.7 Well logs, boring logs, or other sampling point construction diagrams (only if new or replacement monitoring wells, piezometers, or other sampling points are being reported in this report)